I/We Claim:

Claims 1 A two-dimensional radiation image detector characterized in that the top surface of a scintillator sheet which generates fluorescence upon incidence of a radiation has grooves cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the scintillator sheet, with optical fiber bundles being placed in the vertical grooves and a fluorescence reflector buried in the horizontal grooves, that optical fiber bundles are arranged on either the top or the bottom surface of the scintillator sheet or on both surfaces in a transverse direction normal to the optical fiber bundles within the vertical grooves to make a group of detection pixels that are separated by the horizontal and vertical grooves, and that the fluorescence generated by stimulation with the radiation launched into the detection pixels is detected by the optical fiber bundles placed within the vertical grooves in the scintillator sheet and the optical fiber bundles arranged on either the top or the bottom surface of the scintillator sheet or on both surfaces, thereby producing a two-dimensional radiation image.

Claim 2 A two-dimensional radiation image detector characterized in that the top surface of a scintillator sheet which generates fluorescence upon incidence of a radiation has grooves cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the scintillator sheet, with optical fiber bundles being placed in the vertical grooves and a fluorescence reflector buried in the horizontal grooves, that optical fiber bundles are arranged on the bottom surface of the scintillator sheet in a transverse direction normal to the optical fiber bundles within the vertical grooves and radiation detecting mediums that generate fluorescence by stimulation with a radiation are arranged on the top surface, thereby making detection pixels that are separated by the horizontal and vertical grooves, and that the fluorescence generated by stimulation with the radiation launched into the detection pixels and the fluorescence generated from the radiation detecting

mediums are detected by the optical fiber bundles placed within the vertical grooves in the scintiallator sheet and the optical fiber bundles arranged on the bottom surface of the scintillator sheet, thereby producing a two-dimensional radiation image.

Claim 3 A two-dimensional radiation image detector characterized in that the top surface of a fluorescence collecting sheet which has a transmittance that permits adequate transmission of the wavelength of fluorescence has grooves cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the fluorescence collecting sheet, with optical fiber bundles being placed in the vertical grooves and a fluorescence reflector buried in the horizontal grooves, that optical fiber bundles are arranged on the bottom surface of the fluorescence collecting sheet in a transverse direction normal to the optical fiber bundles within the vertical grooves and radiation detecting mediums that generate fluorescence by stimulation with a radiation are arranged on the top surface, thereby making detection pixels that are separated by the horizontal and vertical grooves, and that the fluorescence generated by stimulation with the radiation launched into the detection pixels and the fluorescence generated from the radiation detecting mediums are detected by the optical fiber bundles placed within the vertical grooves in the fluorescence collecting sheet and the optical fiber bundles arranged on the bottom surface of the fluorescence collecting sheet, thereby producing a two-dimensional radiation image.

Claim 4 A two-dimensional radiation image detector characterized in that the top surface of a wavelength shifter sheet which is capable of shifting the wavelength of fluorescence to a different value has grooves cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the wavelength shifter sheet, with optical fiber bundles being placed in the vertical grooves and a fluorescence reflector buried in the horizontal grooves, that optical fiber bundles are arranged on the bottom surface of the wavelength shifter sheet in a transverse direction normal to the optical

fiber bundles within the vertical grooves and radiation detecting mediums that generate fluorescence by stimulation with a radiation are arranged on the top surface, that the fluorescence generated from the radiation detecting mediums is processed to have a different wavelength by the wavelength shifting capability of the wavelength shifter sheet, and that the wavelength-converted fluorescence is detected by the optical fiber bundles placed within the vertical grooves in the wavelength shifter sheet and the optical fiber bundles arranged on the bottom surface of the wavelength shifter sheet, thereby producing a two-dimensional radiation image.

Claim 5 The two-dimensional radiation image detector according to claim 2, wherein the top and bottom surfaces of a scintillator sheet, a fluorescence collecting sheet or a wavelength shifter sheet are alternately provided with grooves that are cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the respective sheets, and a fluorescence reflector is buried in the grooves to make a group of detection pixels that are separated by the horizontal and vertical grooves and which are capable of producing a two-dimensional radiation image.

Claim 6 The two-dimensional radiation image detector according to claim 3, wherein the top and bottom surfaces of a scintillator sheet, a fluorescence collecting sheet or a wavelength shifter sheet are alternately provided with grooves that are cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the respective sheets, and a fluorescence reflector is buried in the grooves to make a group of detection pixels that are separated by the horizontal and vertical grooves and which are capable of producing a two-dimensional radiation image.

Claim 7 The two-dimensional radiation image detector according to claim 4, wherein the top and bottom surfaces of a scintillator sheet, a fluorescence collecting sheet or

a wavelength shifter sheet are alternately provided with grooves that are cut at predetermined spacings in a horizontal and a vertical direction to a depth at least one half the thickness of the respective sheets, and a fluorescence reflector is buried in the grooves to make a group of detection pixels that are separated by the horizontal and vertical grooves and which are capable of producing a two-dimensional radiation image.

Claim 8 A two-dimensional radiation image detector characterized in that a liquid scintillator that generates fluorescence upon incidence of a radiation is used as a detection medium, that a reflector block that is divided into a grid pattern of cells and which is made of a fluorescence reflecting material is placed within a detection vessel capable of sealing off the liquid scintillator, that the detection vessel is then filled with the liquid scintillator, and that the fluorescence generated from the liquid scintillator in each reflector cell upon incidence of a radiation is detected with optical fiber bundles that are arranged both on top of and under the reflector block so as to cross each other at right angles, whereby a two-dimensional radiation image is obtained.

Claim 9 A two-dimensional radiation image detector characterized in that a liquid scintillator that generates fluorescence upon incidence of a radiation is used as a detection medium, that a detection vessel capable of sealing off a liquid scintillator is filled with that liquid scintillator, that one or more detecting blocks of optical fiber bundles that are spaced apart and arranged in a grid pattern of cells so as to cross each other at right angles in a vertical and a horizontal direction are superposed in the direction of the height of the detection vessel, and that the fluorescence generated from the liquid scintillator in each cell upon incidence of a radiation is detected with the detecting blocks to obtain a two-dimensional radiation image.

Claim 10 The two-dimensional radiation image detector according to claim 9, wherein a radiation detecting medium which generates fluorescence upon incidence of a radiation is placed in either the upper part or the lower part or both upper and lower parts of the detection vessel capable of holding the liquid scintillator and the fluorescence emitted from the radiation detecting medium or mediums and the fluorescence emitted from the liquid scintillator in each cell upon entrance of a radiation are detected with optical fiber bundles to produce a two-dimensional radiation image.

Claim 11 The two-dimensional radiation image detector of claim 8, wherein the detection vessel capable of holding the liquid scintillator is equipped with a liquid scintillator circulating mechanism comprising at least valves, piping and a pump.

Claim 12 The two-dimensional radiation image detector of claim 9, wherein the detection vessel capable of holding the liquid scintillator is equipped with a liquid scintillator circulating mechanism comprising at least valves, piping and a pump.

Claim 13 The two-dimensional radiation image detector of claim 10, wherein the detection vessel capable of holding the liquid scintillator is equipped with a liquid scintillator circulating mechanism comprising at least valves, piping and a pump.

Claim 14 The two-dimensional neutron image detector of claim 8, wherein the liquid scintillator is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd and if the liquid scintillator is to be combined with the radiation detecting medium, the latter is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd, whereby a two-dimensional neutron image is produced.

Claim 15 The two-dimensional neutron image detector of claim 9, wherein the liquid scintillator is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd and if the liquid scintillator is to be combined with the radiation detecting medium, the latter is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd, whereby a two-dimensional neutron image is produced.

Claim 16 The two-dimensional neutron image detector of claim 10, wherein the liquid scintillator is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd and if the liquid scintillator is to be combined with the radiation detecting medium, the latter is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd, whereby a two-dimensional neutron image is produced.

Claim 17 The two-dimensional neutron image detector of claim 11, wherein the liquid scintillator is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd and if the liquid scintillator is to be combined with the radiation detecting medium, the latter is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd, whereby a two-dimensional neutron image is produced.

Claim 18 The two-dimensional neutron image detector of claim 12, wherein the liquid scintillator is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd and if the liquid scintillator is to be combined with the radiation detecting medium, the latter is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd, whereby a two-dimensional neutron image is produced.

Claim 19 The two-dimensional neutron image detector of claim 13, wherein the liquid scintillator is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd and if the liquid scintillator is to be combined with the radiation detecting medium, the latter is mixed with a material that contains at least one neutron converter element selected from among ^{6}Li, ^{10}B and Gd, whereby a two-dimensional neutron image is produced.

Claim 20 A two-dimensional radiation or neutron image detector which uses a scintillator, a liquid scintillator or a phosphor as a detection medium and which determines the incident position of a radiation or neutron by detecting the fluorescence from the detection medium with a grid pattern of crossed optical fiber bundles in a horizontal and a vertical direction, characterized in that in order to construct a radiation image on the basis of the photon detection signals as output for both horizontal and vertical directions by performing photon detection on the fluorescence from the horizontal and vertical optical fiber bundles with a photodetector and a peak height discriminator, pulse signals whose time duration is determined on the basis of the Poisson distribution in correspondence with the fluorescence life of the detection medium which is the scintillator, liquid scintillator or phosphor are generated from a retriggerable pulse signal generator that generates retriggerable pulses in response to a timing pulse signal output from the peak height discriminator, these pulse signals being used to acquire a two-dimensional radiation or neutron image.